Total No. of Questions : 8] **SEAT No. :**

P2132 **[Total No. of Pages : 2**

[4930]-101
M.Sc. (Part - I) (Semester - I)
MICROBIOLOGY
MB - 501 : Microbial Diversity & Taxonomy
(Credit System) (2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt five questions.***
2) ***Attempt any 3 questions from Q. 1 to Q. 4.***
3) ***Attempt at least 2 questions from Q. 5 to Q. 8.***
4) ***Figures to the right indicate marks.***
5) ***Draw diagrams wherever necessary.***
6) ***All questions carry equal marks.***
7) ***Use of the logarithmic electronic pocket calculator is allowed.***
8) ***Assume suitable data, if necessary.***

Q1) Attempt *any two* of the following :

a) Discuss the concept of evolutionary r and k selection. **[5]**

b) A water sample from a hyper saline body was analyzed for its bacterial content. Direct microscopic bacterial count were found to be 10^7 cells/ml. On examination by conventional standard plating technique, the counts were found to be 10^4 CFU/ml. Explain the reason for the difference in count by above two methods. **[5]**

c) Explain the types of species. **[5]**

Q2) Attempt *any two* of the following :

a) Justify : 'Shannon index is better than the Simpson's index for expressing bacterial diversity in an ecological sample.' **[5]**

b) Given data is obtained from soil sample. The total number of colonies were counted to be 158×10^7. Find out the Simpson index. **[5]**

Sr. No.	Types	No. of colonies
01	Umbonate	39
02	Flate raised	68
03	Convex	51

c) Give the flowsheet diagram for estimating total number of species from a selected environment. **[5]**

P.T.O.

Q3) Attempt *any two* of the following :

a) Explain the characteristics of bacteria in VBNC state. How does this state influence taxonomy. **[5]**

b) Describe the gradient gel electrophoresis techniques. **[5]**

c) Explain the phylogenetic approach of bacterial classification. **[5]**

Q4) Attempt *any two* of the following :

a) Justify : The 16S rRNA is the most widely accepted 'molecular chronometer' in bacterial taxonomy. **[5]**

b) What is a 'molecular clock'? Explain giving suitable examples. **[5]**

c) Describe the importance of protein profiling in bacterial taxonomy. **[5]**

Q5) Attempt *any two* of the following :

a) Justify : Classification of molds is chiefly based on their morphological characters. **[5]**

b) Give salient features of Zygomycetes. **[5]**

c) Give taxonomic characters of Deuteromycetes. **[5]**

Q6) Attempt *any two* of the following :

a) What are the universal primers? Explain how these are applied in microbial taxonomy and diversity. **[5]**

b) Explain the need of extracting total bacterial DNA from habitat. **[5]**

c) Explain any one strategy used for culturing unculaturable bacteria. **[5]**

Q7) Attempt *any two* of the following :

a) What is coevolution? Explain host-parasite coevolution. **[5]**

b) Explain the concept of phylogeny and molecular distances. **[5]**

c) Describe neutral evolution. **[5]**

Q8) Attempt *any two* of the following :

a) Describe the various techniques of DNA-DNA hybridization. **[5]**

b) Write a note on automated sequencer. **[5]**

c) Explain in brief RT - PCR. **[5]**

Total No. of Questions : 8] **SEAT No. :**

P2133 **[Total No. of Pages : 4**

[4930]-102
M.Sc. (Part - I) (Semester - I)
MICROBIOLOGY
MB - 502 : Quantitative Biology
(2013 Pattern) (Credit System)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three questions from 1 to 4 (core credits).***
2) ***Attempt any two questions from 5 to 8 (non-core credits).***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic table / scientific calculator / statistical table and graph paper is allowed.***
7) ***Assume suitable data, if necessary.***

Q1) Attempt *any two* of the following : **[10]**

a) The following results were obtained from the measurement of body length (y) in cm & body weight (x) in gram of 25 fishes

$\sum(x) = 1165, \sum x^2 = 56947, \sum xy = 9024.40,$

$\sum y = 185.20, \sum y^2 = 1434.24$

Find the appropriate regression equation and estimate the body length of fish having weight 50 gms?

b) When 10 sterile nutrient agar plates were exposed (10 min.) in a fruit juice manufacturing unit. Following number of colonies were obtained after incubation.

Number of colonies (CFU) on each agar plate : 10, 13, 17, 22, 27, 30, 31, 32, 8, 10

Calculate standard deviation and coefficient of variation.

c) Calculate the mean median and the mode for the following data series : 19, 20, 17, 11, 19, 19, 15, 8, 15, 20, 17 and 18.

Identify data distribution (skewness)?

P.T.O.

Q2) Attempt *any two* of the following : **[10]**

a) Diagrammatically explain one tailed and two tailed tests.

b) Water samples were taken from the wells of two localities, one from industrial area (1) and the other from non-industrial area (2). The samples were analyzed for lead content and the following data were obtained.

Locality 1	Locality 2
Sample size$_1$ = 30	Sample size$_2$ = 32
Mean$_1$ = 390 ppb	Mean$_2$ = 10 ppb
Stand. Dev$_1$. = 277.5 ppb	Stand. Dev$_2$. = 5 ppb

Test the hypothesis that the average lead concentration in the ground water of industrial area exceeds that of the non-industrial area using t test.

c) A sample of 400 items is taken from a normal population whose mean is 4 and whose variance is also 4. If the sample mean is 4.5, can the sample means be regarded as truly random sample using Z test at 5% level of significance?

Q3) Attempt *any two* of the following : **[10]**

a) In a cross between black and white coat coloured mice, the F_2 individual segregated into 787 black and 277 white coat coloured individuals. Test that these results agree with the expected ratio 3:1.

b) Sixteen laboratory animals were fed a special diet from the birth through age 12 weeks. Their weight gains (in grams) were as follows.

63 68 79 65 64 63 65 64 76 74 66 66 67 73 69 76

Can we conclude from these data that the diet results in a mean weight gain of less than 70 grams? Use Wilcoxon Signed Rank test. (alpha = 0.05)

c) On the basis of information given below about treatment of 200 patients suffering from disease, state whether the new treatment is comparatively superior to the conventional treatment.

Treatment	No. of patients		Total
	Favourable Response	Not favourable response	
New	60	30	90
Conventional	40	70	110
	100	100	200

Q4) Attempt *any two* of the following : **[10]**

a) Calculate the correlation coefficient between two measurements of water quality of a lake.

Salinity (%)	2	4	6	8	10	12	14
Dissolved Oxygen (mg/l)	4	2	5	10	4	11	12

b) In nutritional study, 13 children were given a usual diet plus vitamins A & D tablets. While the second comparable group of 12 children was taking the usual diet. After 12 months, the gain in weight in pounds was noted as given in table. Can we say that vitamins A & D were responsible for this difference.

A+D Diet	5	3	4	3	2	6	3	2	3	6	7	5	3
Diet	1	3	2	4	2	1	3	4	3	2	2	3	-

c) Random testing of ABO blood group in the offspring of only AB couples in an Europian population obtained the following distribution of blood groups.

A - 312, AB - 575 & B - 313

Test whether the data is consistent with the normal segregation of alleles in the population (i.e. 1:2:1 ratio)

Q5) Attempt *any two* of the following : **[10]**

a) Construct a histogram and frequency polygon for the following data

Class Interval	Frequency
100 - 150	4
150 - 200	6
200 - 250	13
250 - 300	5
300 - 350	2

b) Explain random sampling methods.

c) Write a note on Survival curves.

Q6) Attempt *any two* of the following : **[10]**

a) There are 64 beds in garden and 3 seeds of particular type of flower are shown in each bed. The probability of a flower being white is $\frac{1}{4}$. Find the number of beds with 3, 2, 1 and 0 white flower.

b) In a town, 10 accidents take place in a span of 50 days. Assuming that the number of accident follows the poison distribution, find the probability that there will be 3 or more accidents in a day.

c) A biostatistical problem is given to three students ; A, B and C whose chances of solving it are 1/3, 1/4 and 1/5 respectively. Find out the probability that the problem would be solved.

Q7) Attempt *any two* of the following : **[10]**

a) Explain epidemiological study designs.

b) Write a note on Survey design.

c) Two collected samples gave following results

Sample	Size	Sample Mean	Sum of squares
1	10	15	90
2	12	14	108

Test the equality of sample variances using F test or Variance ratio test at 5% level of significance.

Q8) Attempt *any two* of the following : **[10]**

a) What is modeling in biology? Compare deterministic and stochastic model.

b) Explain any population model.

c) A scientist has studied the amount of polymorphism in the alleles controlling the enzyme Lactate Dehydrogenase (LDH) in a species of minnow. From one population, 1000 individuals were sampled. The scientist found the following fequencies of genotypes : AA = .080, Aa=.280; aa=.640. From these data calculate the allele frequencies of the "A" and "a" alleles in this population.

Total No. of Questions : 8] **SEAT No. :**

P2134 **[Total No. of Pages : 2**

[4930]-103
M.Sc. MICROBIOLOGY (Part - I) (Semester - I)
MB - 503 : Cell Organization and Biochemistry
(Credit System) (2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Q. 1 to Q. 3 is compulsory.***
2) ***Attempt at least two from Q. 4 to Q. 8.***
3) ***All questions carry equal marks.***
4) ***Draw neat - labelled diagrams wherever necessary.***
5) ***Use of the logarithmic tables and scientific calculators is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following : **[10]**

a) Describe structure and function of globular proteins.

b) Write a note on tautomeric forms of bases and their implication in pairing of bases.

c) Describe the preparation of 200ml of 0.5M KH_2PO_4 - K_2HPO_4 buffer, pH7.5 using acid pKa = 6.86

(Given - MW - KH_2PO_4 = 136, K_2HPO_4 = 174)

Q2) Attempt any two of the following : **[10]**

a) Write a note on apoptosis.

b) Diagrammatically illustrate the working of confocal microscope and comment on its application.

c) Explain the targeting of proteins of ER by post translational pathway.

Q3) Attempt any two of the following : **[10]**

a) Write a note on determination in embryo development.

b) Diagrammatically explain dorso-ventral body axis formation in Drosophila.

c) Describe organizers in xenopus.

P.T.O.

Q4) Attempt any two of the following : **[10]**

a) Write a note on cell communication among Dyctiostellium.

b) Explain the molecular mechanism of quorum sensing in myxobacteria.

c) Describe the formation of biofilm on surfaces with a suitable example. Comment on its significance.

Q5) Attempt any two of the following : **[10]**

a) Write a note on important biological butters.

b) Explain biochemical significance of tautomerism.

c) Explain the mechanism of elimination reactions giving suitable examples.

Q6) Attempt any two of the following : **[10]**

a) Explain the nomenclature of fatty acids.

b) Write a note on derivatives of sugars.

c) Diagrammatically illustrate D-series of ketoses.

Q7) Attempt any two of the following : **[10]**

a) Draw the structure of Vitamin E and explain its biological role.

b) Explain the function of magnesium as a cofactor.

c) Explain any two enzyme catalysed reactions where NAD are involved.

Q8) Attempt any two of the following : **[10]**

a) Explain chemical structure and functions of pancreas hormones.

b) Give major types and functions of thyroid hormones.

c) Write a note on Testicular hormones.

Total No. of Questions : 8] **SEAT No. :**

P2135 **[Total No. of Pages : 2**

[4930]-201
M.Sc. (MICROBIOLOGY) (Semester - II)
MB - 601 : Instrumentation and Molecular Biophysics
(Credit System) (2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any 3 questions from 1 to 4 (core - credits).***
2) ***Attempt any 2 questions from 5 to 8 (non -core - credit).***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables / scientific calculator is allowed.***
7) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following : **[10]**

a) Explain any 2 detectors used in High performance liquid chromatography and state their advantages.

b) At 20ºC, human serum allumin has a diffusion coefficient of 6.1×10^{-7} cm^2/sec, and a sedimentation coefficient of 4.65. The density of water at 20ºC is 0.998. Calculate the MW of allumin, assuming a specific volume of 0.74 at 20ºC.

c) Justify : Iso electric focussing is ideal for separation of amphoteric substances such as protein.

Q2) Attempt any two of the following : **[10]**

a) Describe the components of IR Spectroscope.

b) Diagrammatically represent CD instrument and explain its principle.

c) Determine the primary structure of oligo peptide that gave the following positive mode, MS-MS data.

M/Z 149 305 442 529 617

Use the amino acid residual mass values given below :

Amino acid	Residual mass
Arg	156
His	137
Ser	87
Met	132

P.T.O.

Q3) Attempt any two of the following : **[10]**

a) Explain any 2 methods of protein crystallization.

b) Explain the basic principle of NMR.

c) How is phase refinement of model done in X-ray crystallography.

Q4) Attempt any two of the following : **[10]**

a) Explain the term Retention factor and selectivity factor in chromatography.

b) Describe the components of Spectro Fluorimeter.

c) Explain spin-spin Relaxation parameter in NMR.

Q5) Attempt any two of the following : **[10]**

a) Write a short note on Ramchandran Plot.

b) Describe super secondary structure of protein.

c) Explain any two non-covalent interactions in proteins.

Q6) Attempt any two of the following : **[10]**

a) Comment on : GEN BANK.

b) How does Rasmol help in visualization of protein.

c) Write a short note on Multiple sequence alignment.

Q7) Attempt any two of the following : **[10]**

a) Diagrammatically represent DLS (Dynamic Light Scattering) and explain its working.

b) Explain the role of plants in Nano particle synthesis.

c) Describe magnetotactic Bacteria. Why are iron-oxide nanoparticle of technological interest?

Q8) Attempt any two of the following : **[10]**

a) With suitable example explain α helical structure of protein.

b) Write a short note on BLAT.

c) Briefly explain applications of nanoparticles.

Total No. of Questions : 8] **SEAT No. :**

P2136 **[Total No. of Pages : 3**

[4930]-202
M.Sc. (Part - I) (Semester - II)
MICROBIOLOGY
MB - 602 : Virology
(Credit System) (2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three questions from 1 to 4 (core credits).***
2) ***Attempt any two questions from 5 to 8 (non - core credits).***
3) ***All questions carry equal marks.***
4) ***Draw neat, labelled diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of log tables / scientific calculator is allowed.***
7) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following : **[10]**

a) Diagramatically illustrate any two capsid symmetries in viruses.

b) Explain the process of translation in the production of viral proteins.

c) Comment on : Types of Viral genomes.

Q2) Attempt any two of the following : **[10]**

a) Give classification of viruses based on diseases produced.

b) State IC TV rules for naming viruses and their groups.

c) Enlist general criteria used for classifying viruses. Explain any two criteria in brief.

Q3) Attempt any two of the following : **[10]**

a) What are primary cell lines? How are they used in cultivation and detection of viruses.

b) Comment on : Haemagglutination test as a tool in detection of viruses.

P.T.O.

c) In an animal infectivity assay,

Virus lysate is diluted serially. One ml. of each dilution is injected sub cutanously in mice separately. Using following data calculate LD_{50} value by determining cumulative values.

Note - Each dilution of lysate was inoculated into a set of 6 mice.

Data :

Virus dilution used	Mice died (number)
10^{-1}	6
10^{-2}	6
10^{-3}	4
10^{-4}	1
10^{-5}	0
10^{-6}	0

Q4) Attempt any two of the following : **[10]**

a) Explain the process of replication and packaging of viral genome in infected cells.

b) Justify : specific sites are used to cultivate viruses in embryonated chicken egg.

c) Explain how virion structure contributes in viral classification.

Q5) Attempt any two of the following : **[10]**

a) Draw and explain one step growth curve of T_4.

b) How does bacteriophage Lambda shifts from lysogenic to lytic phase.

c) Describe morphology & genome organization in phage M13.

Q6) Attempt any two of the following : **[10]**

a) Elaborate on DNA vaccines.

b) Enlist types of antiviral agents. Explain action of one type of antiviral agent.

c) What are immuno modulators? Explain their role in the formulation of viral vaccines.

Q7) Attempt any two of the following : **[10]**

a) Describe antigenic characteristics of F.M.D. virus.

b) Compare and contrast between transformation of cells by DNA viruses & RNA viruses.

c) Elaborate on modes of transmission of HIV.

Q8) Attempt any two of the following : **[10]**

a) What are indicator plants? Describe half leaf assay for enumeration of plant viruses.

b) Write a note on disease fore casting.

c) Explain how vectors transmit viruses.

Total No. of Questions : 8] **SEAT No. :**

P2137 **[Total No. of Pages : 3**

[4930]-203
M.Sc. (Part - I) (Semester - II)
MICROBIOLOGY
MB - 603 : Microbial Metabolism
(Credit System) (2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Q1 to Q. 3 is compulsory.***
2) ***Attempt at least two from Q. 4 to Q. 8.***
3) ***All questions carry equal marks.***
4) ***Draw neat - labelled diagrams wherever necessary.***
5) ***Use of the logarithmic tables and scientific calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following : **[10]**

a) Derive the equation for two substrate enzyme catalysed reaction with compulsory order single displacement mechanism.

b) With the help of suitable example explain the role of allosteric enzymes in metabolism.

c) Justify "During competitive inhibition Km increases where as Vm remains constant."

Q2) Attempt any two of the following : **[10]**

a) State the laws of thermodynamics and discuss their role in biological systems.

b) Comment on Nernst equation.

c) Calculate ΔG^{o} of hydrolysis of PEP $\longrightarrow$ pyruvate + Pi

Given :

i) PEP+ADP $\xrightarrow{\text{pyruvate kinase}}$ Pyruvate+ATP keq=3.2×10^{3}

ii) ATP + H_2O $\longrightarrow$ ADP +Pi ΔG^{o}= –7.3 Kcal / mol

P.T.O.

Q3) Attempt any two of the following : **[10]**

a) Describe the energy generation pathway in methanogens.

b) Illustrate with the help of diagram structure and function of mitochondrial ATPase.

c) Comment on 'Oxidative phosphoxylation.'

Q4) Attempt any two of the following : **[10]**

a) Describe voltage gated ion channels.

b) What are liposomes? Add a note on their use.

c) Explain the concept of active transport across membranes with suitable examples.

Q5) Attempt any two of the following : **[10]**

a) Schematically represent biosynthesis of pyruvate family amino acids.

b) How is ammonia assimilated into biomolecules?

c) Explain regulation of glutamine synthetase.

Q6) Attempt any two of the following : **[10]**

a) Compare oxygenic and anoxygenic photosynthesis.

b) Diagrammatically illustrate ETC of photosynthetic plants.

c) Explain carbon assimilation in C_4 plants.

Q7) Attempt any two of the following : **[10]**

a) Write note on regulation of Calvin cycle.

b) Describe the steps involved in synthesis of starch.

c) Explain integration of carbohydrate metabolism in plant cell.

Q8) Attempt any two of the following : **[10]**

a) Describe the steps involved in synthesis of triglycerols.

b) Give the role of lipids as signal molecules.

c) Explain synthesis of stewls with a suitable example.

Total No. of Questions : 8] **SEAT No. :**

P2138 **[Total No. of Pages : 3**

[4930]-301
M.Sc. (Semester - III)
MICROBIOLOGY
MB - 701 : Immunology
(2013 Pattern) (Credit System)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three questions from 1 to 4 (Core credits).***
2) ***Attempt any two questions from 5 to 8 (Non -Core credits).***
3) ***All questions carry equal marks.***
4) ***Draw neat - labeled diagrams wherever necessary.***
5) ***Use of logarithmic tables and scientific calculators is allowed.***
6) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following : **[10]**

a) Explain JAK / STAT pathway for intracellular signaling.

b) Explain in brief cytokine receptor families, giving suitable examples.

c) With the help of diagram, explain structure of B cell receptor.

Q2) Attempt any two of the following : **[10]**

a) Explain regulation of membrane attack unit of complement pathway.

b) Justify, "Clonal energy is the mechanism of induction of peripheral tolerance".

c) How dose of antigen is responsible for regulation of immune response?

Q3) Attempt any two of the following : **[10]**

a) How phagocytic function of a cell is assayed?

b) Describe use of animal models for study of autoimmunity.

c) With the help of a flow-sheet, explain the steps in developing established cell line.

P.T.O.

Q4) Attempt any two of the following : **[10]**

a) With the help of a digram, explain the structure of TCR-CD_3 complex.

b) Explain in brief, Neil Jerne's idiotype network theory.

c) Explain ELISPOT assay technique.

Q5) Attempt any two of the following : **[10]**

a) Describe the similarities and difference between benign and malignant tumors.

b) Explain immune surveillance theory.

c) Give applications of tumor associated antigens.

Q6) Attempt any two of the following : **[10]**

a) Explain immunotherapeutic approaches to *Mycobacterium tuberculosis* infections.

b) Explain the pathophysiology in herpes simplex infections.

c) Explain, why HIV infection leads to opportunistic infections?

Q7) Attempt any two of the following : **[10]**

a) Explain the mechanism of symptoms development in myasthenia gravis.

b) How humoral deficiency disorders are diagnosed?

c) Discuss the prognosis and treatment of complement deficiency.

Q8) Attempt any two of the following : **[10]**

a) Justify, "Migration of animal species from aquatic environment to terrestrial one lead to evolution changes in immune system components of vertebrate".

b) Describe in brief, the evolutionary trend among invertebrate species.

c) Explain the development of non-specific humoral functions in different invertebrates.

Total No. of Questions : 8] **SEAT No. :**

P2139

[Total No. of Pages : 3

[4930]-302
M.Sc. (Semester - III)
MICROBIOLOGY
MB - 702 : Molecular Biology - I
(2013 Pattern) (Credit System)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three questions from 1 to 4 (core credit).***
2) ***Attempt any two questions from 5 to 8 (non -core credit).***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of log tables / graph papers / scientific calculator is allowed.***
7) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following : **[10]**

a) Describe the three hybrid assay technique in yeast genetics.

b) Comment on - DMS foot printing as tool in molecular biology.

c) State the significance of RFLP and its association with disease prediction.

Q2) Attempt any two of the following : **[10]**

a) Explain the mechanism of negative control of *lac* operon.

b) Comment on : repression loop in the fine control of *ara* operon.

c) Justify - Attenuation is required in regulation of *trp* operon.

P.T.O.

Q3) Attempt any two of the following : **[10]**

a) Diagrammatically illustrate formation of mature mRNA from its pre-mRNA transcript.

b) What is RNA interference in r RNA processing?

c) Comment on : Si RNA.

Q4) Attempt any two of the following : **[10]**

a) Give a protocol for preparation of a DNA probe.

b) Explain the singificance of sigma factor switching in phage infection.

c) Comment on : Gene silencing and its significance.

Q5) Diagrammatically illustrate any two of the following : **[10]**

a) Mu transposition.

b) Retroposon and its transposition.

c) Replicative transposition.

Q6) Attempt any two of the following : **[10]**

a) Explain any one method used to determine molecular weight of a new protein.

b) What are global biochemical network? Explain with suitable example.

c) Explain "targeted metabolite profiling" with suitable example.

Q7) Attempt any two of the following : **[10]**

a) Explain the role of reverse transcriptase in PCR. Give its advantages over other types of PCR.

b) Comment on : DNA microarray as a diagnostic tool.

c) Comment on : Hot start PCR.

Q8) Attempt any two of the following : **[10]**

a) Justify : '**IS** is an integral part of every **Tn**'.

b) Explain the importance of biomarkers in proteomics.

c) Give applications of PCR.

Total No. of Questions : 8] **SEAT No. :**

P2140

[Total No. of Pages : 3

[4930]-303

M.Sc. (Semester - III)

MICROBIOLOGY

MB - 703 : Industrial Waste Water Treatment

(2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three from Q.1 to Q.4.***
2) ***Attempt any two from Q.5 to Q.8.***
3) ***All questions carry equal marks.***
4) ***Draw neat labelled diagrams wherever necessary.***
5) ***Use of logarithmic tables and scientific calculators is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following : **[10]**

a) Describe the major components of industrial waste water.

b) Explain the use of indicator organism in waste water treatment. Enlist different indicators.

c) Explain any one method in detail for estimating parameters used for determining waste water treatment efficacy.

Q2) Attempt any two of the following : **[10]**

a) Explain the significance of flow equalization in waste water treatment plant.

b) Describe various screening devices used in pretreatment.

c) Differentiate between floatation and flocculation.

P.T.O.

Q3) Attempt any two of the following : **[10]**

a) Enlist the various aerobic biological processes used in waste water treatment. Describe activated sludge process in detail.

b) Describe various type of settling phenomenon involved in sedimentation.

c) The BOD/COD ratio and the TDS of an industrial effluent were found to be 0.3 and 75 mg/dm^3. Suggest the suitable biological treatment to be given along with justification.

Q4) Attempt any two of the following : **[10]**

a) Describe the need for waste water treatment.

b) Explain the continuous granular medium filteration.

c) A industrial waste water having a BOD of 250 mg/L is to be treated by a two stage trickling filter. The desired effluent quality is 25mg/L of BOD. If both of the filter depths are to be 1.83 meter and the recirculation ratio is 2:1, find out the required filter diameter for each filter.

Design assumptions : Flow rate = 7570 m^3/d, waste water temperature = 20ºC, BOD removal in primary sedimentation = 35%, $E_1 = E_2$.

Q5) Attempt any two of the following : **[10]**

a) Schematically represent effluent treatment layout for dairy industry and briefly explain each step.

b) How is colour removed from effluent of paper industry.

c) Explain tertiary treatment process for dyeing industry effluent.

Q6) Attempt any two of the following : **[10]**

a) What is EIA? Explain the need for it to be introduced.

b) Explain different types of Environmental impacts.

c) Explain phase I, EIA study.

Q7) Attempt any two of the following : **[10]**

a) Explain the principle and working of MBBRs.

b) Describe the advantages of RBCs.

c) Draw a schematic diagram of typical SAFF and explain its functioning.

Q8) Attempt any two of the following : **[10]**

a) Delineate the characteristics of food processing industry effluent.

b) What is significant impact? How is it determined in EIA.

c) Differentiate between MBRs and MBBRs.

Total No. of Questions : 8] **SEAT No. :**

P2141 **[Total No. of Pages : 3**

[4930]-401
M.Sc. (MICROBIOLOGY) (Semester - IV)
MB - 801 : Pharmaceutical & Medical Microbiology
(Credit System) (2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three questions from 1 to 4 (core credits).***
2) ***Attempt any two questions from 5 to 8 (non - core credits).***
3) ***All questions carry equal marks.***
4) ***Draw neat labeled diagrams wherever necessary.***
5) ***Use of logarithmic tables / graph papers / scientific calculators is allowed.***
6) ***Figures to the right indicate full marks.***
7) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following : **[10]**

a) Which of the Paul Ehrlich's postulate is relevant to the present day preclinical drug development? Explain giving suitable examples.

b) Explain in brief, the principles and tools applied in rational drug discovery.

c) Describe the steps in toxicity testing of a candidate drug.

Q2) Attempt any two of the following : **[10]**

a) Discuss the factors affecting susceptibility testing in liquid media.

b) Compare Stokes method and Kirby Bauer method of the susceptibility testing.

c) Describe the susceptibility testing methods used for viruses.

Q3) Attempt any two of the following : **[10]**

a) Describe the anchoring mechanisms of pathogenic bacteria.

b) Explain role of extracellular enzymes in bacterial pathogenesis.

c) With the help of a diagram, explain the mode of action of tetanus toxin.

P.T.O.

Q4) Attempt any two of the following : **[10]**

a) Describe use of placebo to overcome bias, in clinical trials.

b) How CLSI monitors the pattern of development of drug resistance among pathogens?

c) Justify, "Bacterial pathogens modulate host cytoskeleton to their advantage".

Q5) Attempt any two of the following : **[10]**

a) Explain the laboratory methods of study interactions of antimicrobials.

b) How flow cytometric analysis helps in developing insight in mode of action of an antimicrobial agent?

c) List the drugs targeting cell wall biosynthesis in bacteria. Diagrammatically illustrate the mechanism of action for any one.

Q6) Attempt any two of the following : **[10]**

a) Describe adverse drug reactions, giving its classification.

b) How teratogenic property of a candidate drug is determined during preclinical drug development?

c) Explain the quality management strategies employed in drug manufacturing.

Q7) Attempt any two of the following : **[10]**

a) What is targeted drug delivery? Explain giving suitable examples.

b) What is bioavailability of a drug? How it is determined?

c) Discuss use of transgenic plants in large scale production of biopharmaceuticals?

Q8) Attempt any two of the following : **[10]**

a) What are the mechanisms of drug resistance development by bacterial pathogens? Explain giving examples of MRSA.

b) Justify, "Microorganisms are considered as weapons of biological warfare".

c) Explain the epidemiological approaches in study of avian influenza.

Total No. of Questions : 8] **SEAT No. :**

P2142 **[Total No. of Pages : 3**

[4930]-402
M.Sc. (Semester - IV)
MICROBIOLOGY
MB - 802 : Molecular Biology - II
(2013 Pattern) (Credit System)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three questions from 1 to 4 (core credit).***
2) ***Attempt any two questions from 5 to 8 (non -core credit).***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of log tables / graph papers / scientific calculator is allowed.***
7) ***Assume suitable data if necessary.***

Q1) Attempt any two of the following: **[10]**

a) Explain the principle of Maxam and Gilbert method of genome sequencing.

b) What are SNPs? Give their significance in genomics.

c) Elaborate on DNA imprinting.

Q2) Attempt any two of the following : **[10]**

a) What is meant by DNA cloning? What steps are used to clone genomic DNA?

b) What are expression vectors? Explain the use of an expression vector with suitable example.

c) Give structural details of YAC. State the importance of YAC in cloning.

Q3) Attempt any two of the following : **[10]**

a) With the help of a flow sheet explain synthesis of a novel antibiotic using RDT.

b) How are high quality protein drugs synthesized by constructing recombinant DNA?

c) What genetic mechanism is involved in the synthesis of xanthan gum?

P.T.O.

Q4) Attempt any two of the following : **[10]**

a) What is the difference between a gene and an ORF? Explain whether all ORFs correspond to a true gene?

b) Explain site directed mutagenesis with a suitable example and comment on its importance in genomics.

c) Justify: 'RDT can be used in the synthesis of an amino acid.'

Q5) Attempt any two of the following : **[10]**

a) What ethical issues are associated with the use of GM crops?

b) What are genetically modified animals? For what purposes they are produced?

c) Give structural details of a Ti plasmid. Explain the use of Ti plasmid in the production of transgenic plants.

Q6) Attempt any two of the following : **[10]**

a) What is meant by bioremediation? Explain why *Pseudomonas* is called a superbug.

b) Give a flow sheet for the production of fructose and alcohol from starch Explain how alcohol production can be improved using GMO.

c) What are xenobiotics? Giving suitable example explain a mechanism of engineered pathway for degradation of a xenobiotic compound.

Q7) Attempt any two of the following : **[10]**

a) Elaborate on various genetic techniques used in sequencing human genome?

b) What are the salient features of *E. coli* genome project?

c) Give significance of human genome project in disease investigation and treatment.

Q8) Attempt any two of the following : **[10]**

a) Giving suitable examples explain how a GM plant can act as bioreactor for the production of a variety of therapeutic agents.

b) How will you screen recombinant *E.coli* strains liberating cellulase?

c) Write a protocol for gene annotation.

Total No. of Questions : 8] **SEAT No. :**

P2143

[Total No. of Pages : 3

[4930]-403
M.Sc. (Semester - IV)
MICROBIOLOGY
MB - 803 : Microbial Technology
(2013 Pattern) (Credit System)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:-

1) ***Attempt any three questions from 1 to 4 (core credits).***
2) ***Attempt any two questions from 5 to 8 (non -core credits).***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables / scientific calculator is allowed.***
7) ***Assume suitable data if necessary.***

Q1) Attempt any two of the following: **[10]**

a) With the help of a diagram, describe the construction of a bioreactor used for immobilized cells.

b) Justify 'In continuous culture specific growth rate is controlled by dilution rate'. Describe the operation of basic chemostat with modification for feeding back.

c) Explain the construction and flow patterns created by a Rushton turbine.

Q2) Attempt any two of the following : **[10]**

a) Justify 'Rheogram of Newtonion fluids deviate from that of non - Newtonion Fluids' with examples.

b) What is 'OTR'and 'OUR' in context with a fermentation process? Explain with a suitable example.

c) Explain the principle, construction and operation of a pH sensor.

P.T.O.

Q3) Attempt any two of the following : **[10]**

a) Delineate the critical operating parameters for chitinase production.

b) *Bacillus licheniformis* ATCC 21415 cells were immobilized on sodium alginate of different concentration using same amount of biomass.

Results obtained are as shown in figure as unit of proteolytic activity (PU).

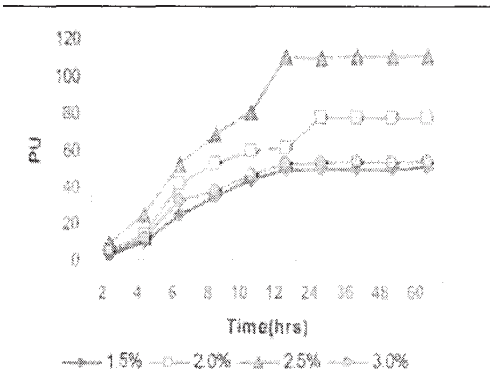

Figure : Effect of sodium alginate concentrations on protease production. Interpret the results and explain which concentration of alginate is most suitable for maximum proteolytic activity and why?

c) Explain the types of IPR.

Q4) Attempt any two of the following : **[10]**

a) With the help of a diagram, describe the construction and typical dimensional ratios of CSTR.

b) Explain the principle, construction and operation of a DO sensor.

c) Graphically represent the relationship between viscosity of medium, biomas and pullulan produced during typical batch fermentation and give the justification.

Q5) Attempt any two of the following : **[10]**

a) Explain kinetics of growth and product formation.

b) Describe the concept of growth associated and growth non-associated metabolites.

c) How the mycellial filamentous forms affects the growth of fermentation process.

Q6) Attempt any two of the following : **[10]**

a) Describe fungi as biofertilizer with suitable examples.

b) Explain the architecture of fungal cell wall.

c) Use of fungi in biosensors and fuel cells.

Q7) Attempt any two of the following : **[10]**

a) Explain recombinant form of natural proteins erythropoietin.

b) Describe the production of recombinant enzyme lipase.

c) Explain production of malaria vaccine by using recombinant DNA technology.

Q8) Attempt any two of the following : **[10]**

a) What is ISO certification.

b) Write short note on SOP preparation.

c) Explain the principles of validation process.